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Change in breastfeeding patterns in Scotland between 2004 and 2011 and the role of health policy

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ABSTRACT

Background: Substantial investments in promoting breastfeeding have taken place in the last 10 years in Scotland. This study assesses whether there were significant changes in breastfeeding initiation and mixed breastfeeding duration between 2004-2005 and 2010-2011.

Methods: Representative national samples of two cohorts of babies in Scotland born between June 2004-May 2005(N:5030), and March 2010-February 2011(N:5838). Multivariate logistic regression for breastfeeding initiation and multivariate survival analysis for breastfeeding duration using cross-sectional data based on maternal recall.

Results: An increase in breastfeeding initiation from 60% to 63% was not significant ($p=0.125$), and controlling for covariates there was no significant cohort effect when comparing breastfeeding initiation between cohorts (OR 1.02, 95%CI 0.91-1.13). For breastfeeding duration of up to 1 month, the 2010-11 cohort was more likely to give up breastfeeding sooner (HR 1.23, 95%CI 1.12-1.34). However, for breastfeeding durations of over 1 month to 6 months, or over 6 months or longer, the 2010-11 cohort was significantly less likely to give up breastfeeding sooner (HR 0.79, 95%CI 0.70-0.88 and HR 0.79, 95%CI 0.68-0.92 respectively). Breastfeeding duration increased the most among mothers with fewer educational qualifications, and mothers with no qualifications in 2010-11 were far less likely to stop breastfeeding early compared to their counterparts in 2004-05 (HR 0.32, 95%CI 0.17-0.58).

Conclusion: After the one month mark, babies born in 2010-11 were more likely to be breastfed for longer compared to those born in 2004-05, and this effect was particularly pronounced among more disadvantaged families. The potential causal role of health policy is discussed.

Key words: longitudinal analysis, lactation, infant feeding, policy evaluation, public health

INTRODUCTION

Evidence on breastfeeding benefits

A wealth of research has focused on the positive health outcomes of breastfeeding for mother and child.¹⁻⁵ Public health policy at international level has since the 80s and 90s endorsed higher breastfeeding initiation and longer duration rates, regulation of breast milk substitutes through a series of policy initiatives, including the International Code of Marketing of Breastmilk Substitutes⁶ the Innocenti Declaration which also announced the launch of the Baby Friendly Hospital Initiative⁷ and the Global strategy for infant and young child feeding.⁸

Recent data for England and Wales suggested that for the first time since at least 2003-04 the proportion of mothers who initiated breastfeeding fell by c.5,700 in 2012-13 (although this difference was not statistically significant).⁹ These data prompted the Royal College of Midwives to state that the coalition government had abandoned infant feeding strategies and that newer generations of mothers would not benefit from expert advice and support now that investment in breastfeeding promotion was being curtailed.¹⁰

Breastfeeding in Scottish Public Health Policy

Among developed nations, Scotland has been at the forefront of public health policy in terms of breastfeeding promotion. Changes have occurred at policy level, in national legislation, in hospital maternity care protocols and in health-care staff training (Box 1). Increased promotion in breastfeeding was matched by an increase in research articles exploring the topic. In PubMed, in the 6 years between 1998 and 2004 inclusive, 363 articles were

published with the term “breastfeed” in the title or abstract, and this doubled to 674 articles in 6 years between 2005 and 2011 inclusive. Similarly, media interest on the topic increased. For example, BBC news online featured 34 articles with the term “breastfeed” in the title between 1998 and 2004, and 75 articles between 2005 and 2011 suggesting increased media coverage and public interest in breastfeeding.

<BOX 1 HERE >

One of the key shifts in health service provision for young children in Scotland from 2005 onwards was moving from a model of universalism to one of progressive universalism, whereby families and children assessed as being more vulnerable would be offered more intensive support.¹⁴ Scotland is what can in research terms be defined as a ‘natural experiment’,¹⁷ where a multi-faceted national intervention for the promotion of breastfeeding has been rolled out, presenting a unique opportunity for analysis.

Evaluation of policy influence on breastfeeding rates

There is a mixed body of literature which evaluates the effect of interventions looking to increase breastfeeding take-up and duration, but few studies focus on a nation as a whole. Studies have highlighted the benefits of hospital-based breastfeeding initiatives,^{18–20} and initiatives involving change throughout maternity health care provision.²¹ Some studies have looked at area-based breastfeeding support programmes,²² while a large body of research has evaluated much smaller scale interventions, such as workplace interventions.²³ Political support for breastfeeding at a national level is key in promoting uptake and duration, whether this comes in the form of international and national policies to regulate the formula milk provision and to promote breastfeeding,^{18,21} or more specifically ensuring that economic and

labour market policies such as maternity leave provision and flexible employment opportunities are compatible with national breastfeeding targets.^{20,24}

This paper seeks to assess whether significant change in breastfeeding initiation and breastfeeding duration has occurred between 2004-05 and 2010-11 among mothers in Scotland, and to explore whether any change over time can be attributed to policy, social and cultural changes in Scotland once socio-economic characteristics of parents are accounted for.

METHODS

Sample

Growing Up in Scotland (GUS) survey data was judged to be an appropriate data source for this research question. It is a study with two separate nationally representative cohorts of babies born in Scotland in 2004-2005 and 2010-2011. Based on a complete case analysis, and following the exclusion of twin and triplet births because of their very different post-partum needs,²⁵ the working sample consisted 5030 and 5838 participants for cohort 2004-05 and 2010-11 respectively (further sample details in box S1, web supplement only). GUS survey design is described fully elsewhere.²⁶ Previous analyses of infant feeding habits using GUS data have explored predictors of breastfeeding initiation,²⁷ the link between employment and breastfeeding duration.²⁴ Eligible children were sampled from the Child Benefit Register by the Department of Work and Pensions. Babies were approximately 10 months old at the time of interview. Interviews were carried out in the homes of the participants using computer-assisted personal interviewing. The survey aimed to interview the main carer of the sample child, which was predominantly (99% of cases) the mother. Separate survey weights for each cohort were applied for the analyses.

Dependent variables

Table 1 shows weighted descriptive statistics for breastfeeding initiation and duration for each cohort. Mothers were asked whether they had ever breastfed the sample child. This was used as the outcome for binary logistic regression exploring change in breastfeeding initiation. In total, 3100 mothers in cohort 2004-05 and 3786 mothers in cohort 2010-11 had breastfed at least once (table 1), and the analysis of breastfeeding duration focuses on this sub-sample. These mothers reported how old the child was when it was last breastfed. By the first interview, 578 infants (19%) in the 2005 cohort were still being breastfed at 10 months,

as were 755 (20%) of the 2010 cohort (difference not statistically significant, $p=0.362$). Thus, the duration spanning from 1 day to 10 months inclusive was analysed and mothers who breastfed for longer were included in the analysis but censored at 10 months. Breastfeeding duration data was retrospective based on maternal recall of breastfeeding duration at the first interview 10 months post-partum.

< TABLE 1 HERE >

The breastfeeding questions in the 2004-05 survey cohort were designed to monitor previous Scottish Government targets²⁸ and therefore asked about any type of breastfeeding, including both exclusive and mixed breastfeeding. After the Scottish Government streamlined its targets with WHO targets based on exclusive breastfeeding,⁸ the subsequent survey cohort in 2010-11 asked mothers both about exclusive breastfeeding, as well as about mixed breastfeeding so as to obtain comparable data with the 2004-05 cohort. Comparisons of exclusive and complementary breastfeeding have been reported elsewhere and will not be reproduced here.²⁹

For the 2004-05 cohort, one in three mothers were still practising mixed feeding up to 6 months (table 1), while we know from other data that virtually no mothers (<1%) were still breastfeeding exclusively at 6 months.³⁰ Similarly for the 2010-11 cohort, one in three mothers were practising mixed feeding up to 6 months (table 1) and 11% were breastfeeding exclusively.²⁹ Given the very low proportion of mothers breastfeeding exclusively for prolonged periods in both cohorts, and particularly in the earlier one, looking at complementary, rather than exclusive, breastfeeding allows for an analysis of feeding duration to look at a much larger number of mothers for a much longer period of time.

Independent variables

A list of all independent variables used in analyses and a bivariate analysis of differences in family characteristics between the two cohorts are shown in table 1.

Cohort

Cases from both cohorts were pooled into one working dataset, and one variable specified which cohort different children belonged to. The cohort variable was then included in all analyses, both alone and in interaction terms with other independent variables.

Social stratification

Dimensions used to capture social stratification included maternal education, maternal occupation-based social class (NS-SEC), household equivalised income, and Scottish Index of Multiple Deprivation (SIMD). Methodological details have been provided elsewhere for the NS-SEC scheme,³¹ the income equivalisation procedure,³² and the derivation of SIMD scores.³³

Family characteristics

The mother's age at the time of birth of the sample child, whether there were one or two parents in the household, and details on the mother's ethnic status were also controlled for. Binary ethnicity question (white vs. non-white) would have been of limited value in differentiating between white European migrants in Scotland, for example Polish migrants who have come to Scotland in large numbers in the last decade.^{34,35} For this reason, the analyses also controls for families where a language other than English was spoken in the home.

Employment and Maternity Leave

One variable captured mothers' working status. The variable measuring maternity leave accounted for all paid and unpaid leave taken by the mother. Information on maternity leave was based on retrospective recall of mothers at the first survey sweep, 10 months postpartum, and may thus be subject to recall bias.

Statistics

Breastfeeding Initiation: Binary Logistic Regression

Binary logistic regression models were specified for the analysis of breastfeeding initiation.

The binary outcome is coded so that models predict whether mothers ever breastfed the sample child. The independent variable capturing family cohort was included in the model as a stand-alone variable, and then as an interaction term with education (no other significant interaction terms were found).

Breastfeeding Duration: Proportional Hazards Regression

Breastfeeding duration data was analysed using proportional hazards regression models.

Exploratory analyses were performed by comparing survival rates for individual independent variables through Kaplan–Meier plots. Tests of equality of survival were based on the log rank test. Independent variables were explored further through subsequent multivariate proportional hazards regression models. These provide hazard ratios for the cessation of breastfeeding for each category of each independent variable adjusting for the remaining variables in the model.³⁵ Visual examination of survival plots and tests of proportionality of

cessation using saved scaled schoenfeld residuals were carried out to test that the difference in breastfeeding cessation rates between groups was proportional over time.³⁵

The exploratory analyses suggested that difference in breastfeeding cessation rates between cohorts was not proportional throughout the entire duration explored. To account for this, the breastfeeding duration period was split into 3 time periods: 0-1 months, 1 to 6 and 6 months or longer.³⁵ Tests of proportionality of cessation using saved scaled schoenfeld residuals for each time-span showed that the difference in breastfeeding cessation rates between groups were proportional over time within each of the 3 time-periods. Visual examination of an adjusted Kaplan Meier plot stratifying breastfeeding duration by cohort and education (figure S2, web supplement only) showed that there was a large improvement in breastfeeding duration among mothers with no qualifications in the later cohort compared to those in the earlier cohort. As such, a separate cox regression model was specified to include an interaction term between cohort and education (table S3, web supplement only).

Multicollinearity diagnostics showed that none of the predictors reached a tolerance value of less than 0.200, indicating that multicollinearity did not interfere with results.³⁶ Stata version 12.1 was used for all analyses.

RESULTS

Breastfeeding Initiation

A bivariate comparison of breastfeeding initiation and duration between the two cohort (table 1) suggest that the small increase in the proportion of mothers breastfeeding at least once (increase of c 3%), was not significant. Table 2 displays the results of the logistic regression analyses. Odds ratios (OR) reported in this table capture the chance of having breastfed a baby at least once, where an OR greater than 1 reflects a higher chance, and an OR less than 1 reflects a lower chance, of having breastfed a baby at least once. The 2010-11 cohort did not have a significant advantage in terms of breastfeeding take-up (OR 1.02, 95% CI 0.91-1.13). Among the control variables, maternal education seemed a particularly good dimension through which to capture differences in breastfeeding initiation habits. Compared to mothers with degrees or equivalent, those with no qualifications were far less likely to breastfeed even once, and this applied to both cohorts (OR 0.18, and 0.16). Interaction terms between education and sample cohort were not found to be significant. Mothers in households where a language other than English was spoken had a 4 fold chance of having breastfed their child compared to mothers where only English was spoken.

<TABLE 2 HERE >

Breastfeeding Duration

Table 1 shows that compared to the earlier cohort, mothers in the 2010-11 cohort were more likely to both stop breastfeeding before the 1 month threshold (28% rose to 32%), but also more likely to breastfeed for more than 10 months (18% rose to 19%). A Kaplan Meier plot adjusting for all covariates controlled for in subsequent multivariate analyses shows that after the 1 month mark, the 2010 cohort breastfed for longer than the 2004-05 cohort.

The survival analyses in table 3 capture the relative risk of ceasing to breastfeed, for mothers that had breastfed at least once. A hazard ratio (HR) greater than 1 points to a higher relative risk of giving up breastfeeding sooner compared to a reference category, and an HR lower than 1 points to a lower relative risk of breastfeeding cessation. These show that mothers in the 2010-11 cohort had a higher risk of breastfeeding cessation compared to those in the 2004-05 cohort (HR 1.23), and this was more pronounced when looking only at mothers who were in paid employment before the birth (HR 1.42). However, after the first month of breastfeeding, it seems that being in the 2010-11 cohort is associated with a lower risk of breastfeeding cessation compared to mothers in the 2004-05 cohort, with a similar hazard ratio noted for both subsequent time-periods (HR 0.79 for over 1-up to 6 months, and HR 0.79 for over 6 months). Similar hazard ratios were obtained for the subsample of mothers in paid employment. For the 2010-11 cohort, the most common reason for stopping to breastfeed was the mother reporting that she did not have enough milk (30%, data not shown), but since this data was not collected for the 2004-05 cohort, it was not possible to look at differences between cohorts.

<TABLE 3 HERE >

Interactions with maternal education

There was a significant interaction between time and education (table S3, web supplement only) which was more pronounced for mothers with fewer educational qualifications. For example, looking at breastfeeding durations of up to 1 month, mothers with standard grade, higher grade, and vocational qualifications in the 2010 cohort, were all more likely to give up

breastfeeding sooner than their 2005 counterparts (HR 1.34, HR 1.38, HR 1.62 respectively).

There was no significant difference between cohorts for mothers with no qualifications and mothers with degrees.

The trend reversed when looking at breastfeeding durations of over 1 month and up to 6 months and mothers with no qualifications in the 2010-11 cohort were more likely than the 2004-05 counterparts to keep breastfeeding for longer within this period (HR 0.57). There was no significant difference when comparing mothers with degrees between cohorts for this period. The trend is even more pronounced for breastfeeding over 6 months where those with no qualifications in the 2010-11 cohort were far more likely to continue breastfeeding after 6 months compared to their 2004-05 counterparts (HR 0.37).

DISCUSSION

This research shows that there was a small (3%) but non-significant increase in the number of mothers who breastfeed at least once when comparing mothers of babies born in 2004-05 and mothers of babies born in 2010-11. Among mothers who did breastfeed, those in the later cohort were significantly more likely to stop breastfeeding early compared to those in the 2004-05 cohort, when looking at breastfeeding duration of up to 1 month. After the 1 month mark, mothers in the 2010-11 cohort were consistently more likely to breastfeed for longer than their counterparts in 2004-05.

One explanation for the higher risk of breastfeeding cessation among the 2010-11 cohort within the first month of breastfeeding could be that within the c. 3% increase in mothers who do start breastfeeding in 2010-11 compared to 2005-04, there were mothers who were already at a higher-risk of early breastfeeding cessation, and who for either medical reasons, practical reasons related to work, or personal preference, did not continue to breastfeed past the 1 month mark. The higher breastfeeding cessation rate in the first month for the 2010 cohort could thus simply reflect that mothers less likely to breastfeed successfully in the first place, were more likely to give breastfeeding a try in 2010-11 compared to 2004-05.

Further analyses also suggested that cohort differences were strongest among mothers with no qualifications, and weakest among those with degree level education. This suggests that changes in legalisation, policy, services and culture in Scotland which have occurred in the area of breastfeeding have had far more influence on disadvantaged mothers. This is a highly important and encouraging finding, since it is often the case that the social strata less in need

of public services are those who capitalise on such services the most.³⁷ Our findings confirm well established evidence that universal policies to address health related issues, are the ones most likely to influence harder to reach populations,³⁸ and suggests that the ‘progressive universalism’ adopted from 2005 onwards¹⁴ may have been partly responsible for the positive change in breastfeeding habits among less advantaged mothers.

In relation to other studies, this paper has the benefit in that it assesses change in society-wide breastfeeding habits following universal changes in society with regard to legislation, health policy, and public debate, whereas several existing studies have looked at area-based, rather than national, interventions;²² at more isolated loci of intervention, such as hospitals;^{18–20} or at work-based interventions.²³ One recent study published by Hawkins et al evaluated the impact of different breastfeeding laws across states in the USA on breastfeeding initiation and duration.³⁹ It concluded that in states where laws which supported breastfeeding had been implemented, breastfeeding initiation rates increased, as did breastfeeding duration although the effect was weaker. More importantly, the positive effects on breastfeeding were strongest among ethnic minorities and mothers with fewer educational qualifications, suggesting that state-wide universal policy and legalisation reduced inequalities in infant feeding practises.

Limitations of this study include that breastfeeding duration data was based on maternal recall at 10 months post-partum and that data was on mixed feeding, rather than the exclusive feeding currently recommended by the Scottish Government and the WHO. It was not possible with this data to explore any prior upward trends in breastfeeding initiation and duration before 2004-05. Infant Feeding Survey data point to an increase in breastfeeding initiation between 2000 and 2005³⁰ but since this draws on very different survey

methodology actual figures are not directly comparable to those in this study. It is possible that pre-2005 policy developments and anticipation of changes introduced from 2005 onwards had already positively influenced infant feeding for the 2004-05 cohort. Also, while this research assumes that change in breastfeeding habits not explained by control variables is explained by a cohort effect, it is unable to disentangle what specific aspects which have changed from one cohort to another have been the primary drivers of this change. For example, it is difficult to establish whether specific changes in maternity care are mostly responsible for longer breastfeeding among less educated mothers, or whether this is mainly due to high media coverage of breastfeeding issues, or promotion of breastfeeding in public discourse which have made breastfeeding more culturally acceptable. Future research could also explore whether differences in the adoption of breastfeeding-friendly legislation and health policy between Scotland and the rest of the UK can be linked to different patterns of change in maternal infant feeding habits.

This research provides further evidence that universal multi-faceted policies, consolidated with legislation, are a successful way to target hard to reach groups in society. It should be noted that breastfeeding initiation and duration rates in Scotland and the UK are still lagging behind other European countries, and there is still room for improvement. And it is fitting to point out that the highest breastfeeding initiation rates are in Norway, Denmark and Sweden (at 98-99%, 2006-07 data)⁴⁰ which all have generously funded universal and comprehensive health and maternity care provision.

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Conflict of Interest: None declared.

Key Points

- The Scottish Government has invested substantially in promoting breastfeeding initiation and longer duration in the last 10 years.
- Yet, a complex evaluation of whether such investment has translated into improved breastfeeding patterns has not been published.
- There was no significant increase in breastfeeding initiation in Scotland between 2004-11, yet mothers in 2010-11, especially those with fewer educational qualifications, breastfed for longer.
- The findings support proportionally universal health policies to improve health behaviours of less advantaged population groups.

Ethics approval: The Growing Up in Scotland study received ethics approval by the Scotland 'A' MREC committee (application reference: 04/M RE 1 0/59).

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BOX & TABLES

Box 1 Overview of infant nutrition policies in Scotland before and after 2005

Pre-2005
<ul style="list-style-type: none">• A National Breastfeeding Adviser was appointed in 1995¹¹• The Scottish Breastfeeding Group was launched in 1995¹¹• Ready Steady Baby booklet for parents launches in 1998• NHS Scotland worked to promote breastfeeding support groups. By 2004 there were nine breastfeeding peer support programmes and 150 breastfeeding support groups across Scotland^{12,13}• The Integrated Strategy for Early Years launched. This focused on improving support particularly for vulnerable children and their families¹³• Service provision primarily based on ‘universalism’ ideals¹⁴
2005 and later
<ul style="list-style-type: none">• Breastfeeding etc. Act (2005) – legislation. Scotland is the first nation where a mother’s right to breastfeed is protected by law• An Infant Nutrition Co-ordinator was appointed in 2008• The Maternal and Infant Nutrition Strategy is launched¹⁵• The Maternal and Early Years website is launched in 2010 which provides updated information to early years professionals on topics including breastfeeding.• The latest Off to a Good Start booklet for parents provides information and contact details for several networks and resources, many of which web-based, to which parents can turn to for additional advice on breastfeeding¹⁶• Gradual change to ‘progressive universalism’ implementing extra support targeted to those most in need¹⁴

Table 1 Comparison of sample characteristics for cohorts 2004-05 and 2010-11

<i>Weighted data^a</i>	Cohort 2004-2005 (N:5030)		Cohort 2010-2011 (N:5838)		Δ^c
	% (Cum^b %)	[95% CI]	% (Cum^b %)	[95% CI]	
If child was ever breastfed					0.125
No	39.6	[37.0-42.3]	36.9	[34.8-39.0]	
Yes					
Breastfeeding Duration	<i>N:3100</i>		<i>N:3786</i>		0.018
One month or less	28.3	[26.2-30.5]	31.7	[29.8-33.7]	
Over 1 month – up to 2 months	11.3 (39.6)	[10.2-12.5]	9.3 (41.0)	[8.4-10.3]	
Over 2 months – up to 3 months	8.8 (48.4)	[7.8-9.8]	7.2 (48.2)	[6.4-8.0]	
Over 3 months – up to 4 months	6.4 (54.8)	[5.6-7.4]	5.9 (54.1)	[5.2-6.7]	
Over 4 months – up to 5 months	5 (59.8)	[4.4-5.6]	5.1 (59.2)	[4.5-5.9]	
Over 5 months – up to 6 months	7.5 (67.3)	[6.5-8.5]	7.6 (66.8)	[6.7-8.5]	
Over 6 months – up to 7 months	4.5 (71.8)	[3.7-5.4]	4.4 (71.2)	[3.8-5.2]	
Over 7 months – up to 8 months	4.3 (76.1)	[3.6-5.2]	3.4 (74.6)	[2.9-4.1]	
Over 8 months – up to 9 months	3.5 (79.6)	[2.9-4.3]	3.4 (78.0)	[2.8-4.1]	
Over 9 months – up to 10 months	2.1 (81.7)	[1.7-2.7]	2.6 (80.6)	[2.2-3.2]	
Over 10 months	18.3 (100.0)	[16.7-20.0]	19.3 (100.0)	[17.8-20.8]	
Mother's age at birth of sample child					0.010
Under 20	7.9	[6.9-9.1]	6.3	[5.5-7.3]	
20-29	42.6	[40.6-44.6]	46.4	[44.4-48.4]	
30-39	46.4	[44.1-48.7]	43.5	[41.5-45.6]	
40 or older	3.1	[2.6-3.7]	3.7	[3.2-4.3]	
Maternal Education					0.000
Degree or equivalent	26.6	[24.2-29.1]	32.4	[29.8-35.2]	
Vocational qualifications	37	[35.3-38.8]	32.3	[30.7-34.0]	
Higher grade or equivalent	7.4	[6.7-8.1]	8.1	[7.4-8.9]	
Standard grade	18.7	[17.1-20.4]	18.1	[16.7-19.7]	
Other	0.9	[0.6-1.2]	2.3	[1.8-2.9]	
No qualifications	9.4	[8.5-10.5]	6.7	[5.9-7.5]	
Maternal NS-SEC					0.215
Managerial and professional	34.6	[32.1-37.1]	35.5	[33.2-38.0]	
Intermediate	19.4	[18.4-20.5]	17.8	[16.7-19.0]	
Small employers and own account holders	3.7	[3.2-4.3]	3.6	[3.2-4.1]	
Lower supervisory and technical	6.1	[5.5-6.8]	5.4	[4.7-6.1]	
Semi-routine and routine	30.9	[29.0-32.8]	31.2	[29.3-33.2]	
Never worked	5.3	[4.5-6.3]	6.5	[5.6-7.5]	
Equivalised Income					0.130
1 st quintile	19.4	[17.9-21.0]	16.8	[15.4-18.3]	
2 nd	18.3	[17.0-19.6]	17.2	[15.9-18.5]	
3 rd	16.4	[15.2-17.7]	17.2	[16.1-18.3]	
4 th	18.8	[17.4-20.2]	20.6	[19.3-21.9]	
5 th	16.7	[14.8-18.9]	16.6	[14.8-18.5]	
Missing income data	10.4	[9.0-11.9]	11.7	[10.2-13.4]	
SIMD					0.827
1 st Quintile: least deprived	17.9	[14.3-22.2]	17.4	[13.9-21.5]	
2 nd Quintile	19.3	[16.0-23.0]	17.8	[15.0-21.1]	
3 rd Quintile	19.4	[16.4-22.8]	20.1	[17.1-23.4]	
4 th Quintile	18.5	[15.8-21.6]	21.1	[18.2-24.2]	
5 th Quintile: most deprived	24.9	[20.9-29.3]	23.6	[19.7-28.0]	
Family type					0.598
Single parent	20.6	[18.7-22.6]	21.3	[19.5-23.1]	
Couple	79.4	[77.4-81.3]	78.7	[76.9-80.5]	
Ethnicity					0.443
White	96.1	[94.5-97.3]	95.5	[94.5-96.3]	
Non-white	3.9	[2.7-5.5]	4.5	[3.7-5.5]	
Other Language spoken at home					0.005
English only	94.1	[92.5-95.3]	91.2	[89.9-92.3]	
Other language also/only	5.9	[4.7-7.5]	8.8	[7.7-10.1]	
Maternal employment					0.690
Full-time (>=35h)	18.7	[17.5-19.8]	18.3	[17.2-19.5]	
Part-time (<35h)	41.8	[40.3-43.4]	42.7	[41.3-44.1]	

Not in work	39.5	[37.6-41.5]	39	[37.1-40.8]	
Unpaid/Paid Maternity Leave	<i>N:3116</i>		<i>N: 3823</i>		0.000
No leave—up to 1 month	1.6	[1.6-1.6]	1.4	[1.4-1.4]	
Over 1 month—up to 2 months	1.6 (3.2)	[1.6-1.6]	0.3 (1.7)	[0.3-0.3]	
Over 2 months—up to 3 months	5.0(8.2)	[5.0-5.0]	1.8(3.5)	[1.8-1.8]	
Over 3 months—up to 4 months	0.7(8.9)	[0.7-0.7]	0.2(3.7)	[0.2-0.2]	
Over 4 months—up to 5 months	15.1(24.0)	[15.1-15.1]	3.4(7.1)	[3.4-3.4]	
Over 5 months—up to 6 months	41.2(65.2)	[41.2-41.2]	9.3(16.4)	[9.3-9.3]	
Over 6 months—up to 7 months	0.9(66.1)	[0.9-0.9]	0.4(16.8)	[0.4-0.4]	
Over 7 months—up to 8 months	12.2(78.3)	[12.2-12.2]	14.4(31.2)	[14.4-14.4]	
Over 8 months—up to 9 months	4.1(82.4)	[4.1-4.1]	31.4(62.6)	[31.4-31.4]	
Over 9 months—up to 10 months	40(86.4)	[4.0-4.0]	12.3(74.9)	[12.3-12.3]	
Over 10 months	13.6(100.0)	[13.6-13.6]	25.2(100.0)	[25.2-25.2]	

a. All N values are based on un-weighted data. Significance levels: * p <0.05, ** p <0.01, *** p<0.001. 95% confidence intervals in brackets

b. Cum – denotes cumulative percentages in parentheses where relevant

c. Δ denotes difference between cohorts for each variable, Chi2.

Table 2 Binary logistic regression – 2004-05 and 2010-11 cohort differences in breastfeeding initiation

Weighted data ^a	Model 1: Child breastfed at least once (N: 10862)		Model 2: Child breastfed at least once (N: 10862)	
	OR	[95% CI]	OR	[95% CI]
Cohort 2010 (REF: 2005)	1.02	[0.91,1.13]		
Maternal Education (REF: Degree or equivalent)				
Vocational qualifications	0.36***	[0.32,0.41]	0.38***	[0.31,0.46]
Higher grade or equivalent	0.44***	[0.37,0.52]	0.42***	[0.32,0.54]
Standard grade	0.26***	[0.21,0.30]	0.24***	[0.19,0.31]
Other	1.05	[0.65,1.67]	1.15	[0.50,2.60]
No qualifications	0.18***	[0.15,0.22]	0.16***	[0.12,0.21]
Interaction: Cohort by Education (REF: Cohort 2005)				
Cohort 2010 - Degree or equivalent			0.99	[0.81,1.21]
Cohort 2010 - Vocational qualifications			0.92	[0.73,1.16]
Cohort 2010 - Higher grade or equivalent			1.08	[0.77,1.51]
Cohort 2010 - Standard grade			1.13	[0.83,1.53]
Cohort 2010 - Other			0.89	[0.31,2.54]
Cohort 2010 - No qualifications			1.34	[0.93,1.92]
Mother's age at birth of sample child (REF: 40 or older)				
Under 20	0.83	[0.61,1.14]	0.83	[0.61,1.14]
20-29	0.91	[0.71,1.17]	0.91	[0.71,1.17]
30-39	1.01	[0.79,1.30]	1.01	[0.78,1.30]
Maternal NS-SEC (REF: Managerial and professional)				
Intermediate	0.68***	[0.60,0.78]	0.69***	[0.60,0.78]
Small employers and own account holders	0.94	[0.73,1.22]	0.95	[0.73,1.22]
Lower supervisory and technical	0.65***	[0.53,0.80]	0.65***	[0.53,0.80]
Semi-routine and routine	0.68***	[0.59,0.78]	0.68***	[0.59,0.79]
Never worked	0.49***	[0.39,0.63]	0.49***	[0.38,0.63]
Equivalised Income (REF: 5 th quintile)				
1 st quintile	0.72***	[0.59,0.87]	0.73**	[0.60,0.88]
2 nd	0.83*	[0.70,0.99]	0.83*	[0.70,0.99]
3 rd	0.80**	[0.68,0.94]	0.80**	[0.68,0.94]
4 th	1.02	[0.88,1.19]	1.02	[0.88,1.19]
Missing income data	0.94	[0.77,1.14]	0.93	[0.77,1.14]
SIMD (REF: 1 st Quintile: least deprived)				
2 nd Quintile	0.89	[0.75,1.06]	0.89	[0.75,1.06]
3 rd Quintile	0.78**	[0.67,0.92]	0.78**	[0.67,0.92]
4 th Quintile	0.67***	[0.56,0.79]	0.67***	[0.57,0.79]
5 th Quintile: most deprived	0.47***	[0.39,0.55]	0.47***	[0.39,0.55]
Family type (REF: Single parent)				
Couple	1.39***	[1.21,1.58]	1.39***	[1.22,1.58]
Ethnicity (REF: White)				
Non-white	1.33	[0.93,1.90]	1.35	[0.95,1.91]
Other language spoken at home (REF: English only)				
Other language also/only	3.82***	[2.88,5.07]	3.76***	[2.82,5.01]
Maternal employment (REF: Full-time >=35h)				
Part-time (<35h)	0.94	[0.83,1.08]	0.95	[0.83,1.08]
Not in work	0.92	[0.79,1.06]	0.92	[0.79,1.06]
R-squared	0.25		0.25	

a. All N values are based on un-weighted data. Significance levels: * p <0.05, ** p <0.01, *** p<0.001. 95% confidence intervals in brackets

b. Model 1: controlling for socio-economic characteristics. Model 2: also controlling for interaction effect between time(cohort) and maternal education.

Table 3 Proportional hazards regression – 2004-05 and 2010-11 cohort differences in breastfeeding cessation

<i>Weighted data ^a</i>	Model 1: Breastfeeding cessation N:6886		Model 2: Breastfeeding cessation N:4739	
	HR	91% CI	HR	91% CI
Cohort 2010 – up to 1 months of breastfeeding (REF: Cohort 2005)	1.23***	[1.12,1.34]	1.42***	[1.26,1.59]
Cohort 2010 – over 1 and up to 6 months of breastfeeding (REF: Cohort 2005)	0.79***	[0.70,0.88]	0.77***	[0.67,0.88]
Cohort 2010 – over 6 of breastfeeding (REF: Cohort 2005)	0.79**	[0.68,0.92]	0.77**	[0.65,0.92]
Maternal Education (REF: Degree or equivalent)				
Vocational qualifications	1.62***	[1.51,1.74]	1.59***	[1.46,1.73]
Higher grade or equivalent	1.53***	[1.38,1.70]	1.49***	[1.32,1.69]
Standard grade	1.98***	[1.79,2.19]	2.01***	[1.77,2.28]
Other	1.24*	[1.01,1.52]	1.13	[0.84,1.52]
No qualifications	1.84***	[1.57,2.16]	1.58***	[1.21,2.07]
Mother's age at birth of sample child (REF: 40 or older)				
Under 20	2.38***	[1.93,2.95]	2.35***	[1.70,3.24]
20-29	1.70***	[1.46,1.99]	1.72***	[1.44,2.05]
30-39	1.38***	[1.19,1.61]	1.38***	[1.16,1.64]
Maternal NS-SEC (REF: Managerial and professional)				
Intermediate	1.06	[0.98,1.15]	1.08	[0.98,1.19]
Small employers and own account holders	0.88	[0.77,1.00]	0.72***	[0.60,0.85]
Lower supervisory and technical	0.94	[0.82,1.09]	0.89	[0.74,1.06]
Semi-routine and routine	1.14**	[1.04,1.24]	1.06	[0.95,1.18]
Never worked	0.94	[0.78,1.13]	n/a	
Equivalised Income (REF: 5 th qui)				
1 st qui	0.82**	[0.73,0.92]	0.73***	[0.61,0.88]
2 nd	0.89*	[0.81,0.98]	0.90	[0.80,1.01]
3 rd	0.87**	[0.79,0.95]	0.90*	[0.81,0.99]
4 th	0.88**	[0.82,0.95]	0.88**	[0.81,0.96]
Missing income data	0.88*	[0.79,0.97]	0.87*	[0.76,0.99]
SIMD (REF: 1 st Quintile: least deprived)				
2 nd Quintile	1.01	[0.94,1.10]	1.01	[0.93,1.11]
3 rd Quintile	1.04	[0.96,1.13]	1.04	[0.95,1.14]
4 th Quintile	1.15**	[1.05,1.25]	1.11	[0.99,1.23]
5 th Quintile: most deprived	1.25***	[1.14,1.38]	1.21**	[1.07,1.37]
Family type (REF: Single parent)				
Couple	0.75***	[0.68,0.823]	0.70***	[0.61,0.81]
Ethnicity (REF: White)				
Non-white	1.07	[0.93,1.230]	1.07	[0.87,1.31]
Other language spoken at home (REF: English only)				
Other language also/only	0.65***	[0.58,0.726]	0.67***	[0.58,0.77]
Maternal employment (REF: Full-time >=35h)				
Part-time (<35h)	0.88***	[0.82,0.937]	0.86***	[0.80,0.92]
Not in work	0.76***	[0.70,0.828]	n/a	
Unpaid/Paid Maternity Leave (REF: Over 10 months)				
No leave—up to 1 month			1.54***	[1.21,1.96]
Over 1—up to 2 months			2.13***	[1.44,3.13]
Over 2—up to 3 months			1.89***	[1.55,2.31]
Over 3—up to 4 months			2.05**	[1.25,3.37]
Over 4—up to 5 months			1.74***	[1.51,1.99]
Over 5—up to 6 months			1.63***	[1.47,1.80]
Over 6—up to 7 months			2.03***	[1.38,2.99]
Over 7—up to 8 months			1.40***	[1.26,1.56]
Over 8—up to 9 months			1.37***	[1.23,1.52]
Over 9—up to 10 months			1.26***	[1.11,1.42]

a. All N values are based on un-weighted data. Significance levels: * p <0.05, ** p <0.01, *** p<0.001. 95% confidence intervals in brackets

b. Model 1: controlling for socio-economic characteristics. Model 2: also controlling for interaction effect between time(cohort) and maternal education.

SUPPLEMENTAL FILES

Box S1 Total sample and working sample details

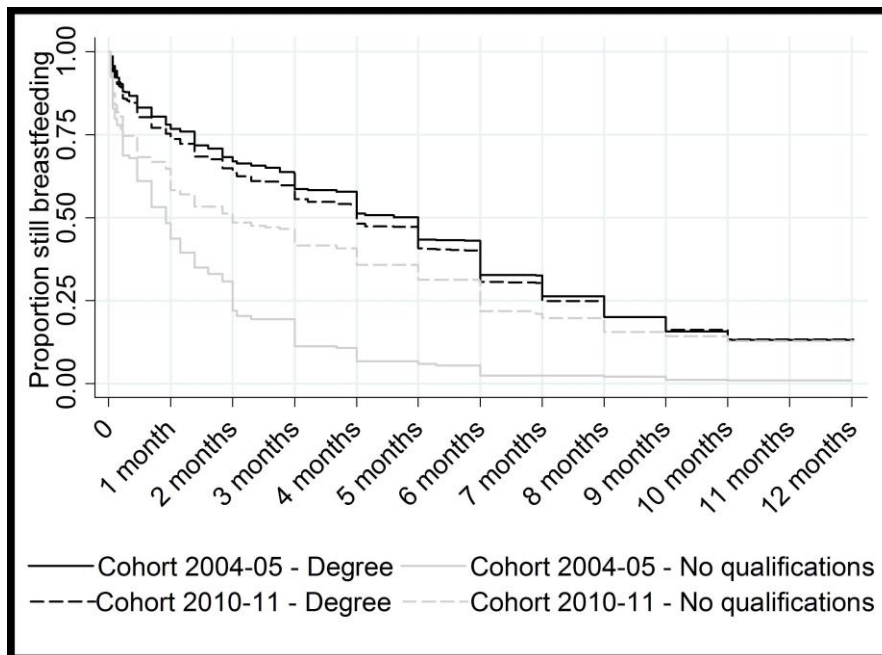
	Cohort 2004-05	Cohort 2010-11
Birth dates	Jun 2004 – May 2005	Mar 2010 – Feb 2011 ^a
Total achieved sample	5216	6127
Complete case analysis for modelled independent variables	5180 (36 missing data)	6085 (42 missing data)
Exclusion of cases where respondent was not the biological mother of the child	5121 (59 cases excluded)	5972 (113 cases excluded)
Exclusion of multiple pregnancies ^b	5030 (91 cases excluded)	5838 (134 cases excluded)
<i>Working sample for breastfeeding initiation</i>	<i>5030</i>	<i>5838</i>
<i>Working sample for breastfeeding duration (exclusion of mothers who never breastfed)</i>	<i>3100^c</i>	<i>3786^c</i>

a. The date-span changed for the second cohort so that when older, children would all start school simultaneously and represent a single school year group.²⁹

b. The post-partum needs of twin or triplets are very different to those of single pregnancies.²⁵

c. This excludes 5 mothers in the 2004-05 cohort and 14 mothers in the 2010-11 cohort who had breastfed but who had no valid data for breastfeeding duration.

Figure S2 Kaplan-Meier survival plots for breastfeeding cessation by cohort and maternal education



Note: Cohort 2004-05(N: 1355); Cohort 2010-11(N:1955). Adjusted for covariates: SIMD, maternal age, NS-SEC, Equivalised income, family composition, maternal ethnicity, if other language spoken, maternal employment status.

Table S3 – Web supplement only - Proportional hazards regression with interaction effects between cohort and education

<i>Weighted data ^a</i>		
	Breastfeeding cessation	
	N:6886	
	HR	91% CI
Maternal Education (REF: Degree or equivalent)		
Vocational qualifications	1.53***	[1.39,1.69]
Higher grade or equivalent	1.53***	[1.32,1.78]
Standard grade	1.99***	[1.74,2.28]
Other	0.73	[0.47,1.15]
No qualifications	2.03***	[1.64,2.50]
Up to 1 month of breastfeeding – Interaction between maternal education and cohort 2010 (Ref: Cohort 2005)		
Degree or equivalent	0.93	[0.80,1.06]
Vocational qualifications	1.62***	[1.36,1.92]
Higher grade or equivalent	1.38*	[1.07,1.79]
Standard grade	1.34**	[1.08,1.67]
Other	2.26**	[1.26,4.06]
No qualifications	1.32	[0.94,1.86]
Over 1 month, up to 6 months of breastfeeding – Interaction between maternal education and cohort 2010 (Ref: Cohort 2005)		
Degree or equivalent	1.04	[0.89,1.22]
Vocational qualifications	0.62***	[0.52,0.75]
Higher grade or equivalent	0.68*	[0.51,0.92]
Standard grade	0.72*	[0.56,0.93]
Other	0.89	[0.56,1.45]
No qualifications	0.57**	[0.38,0.83]
Over 6 months of breastfeeding – Interaction between maternal education and cohort 2010 (Ref: Cohort 2005)		
Degree or equivalent	1.23*	[1.02,1.48]
Vocational qualifications	0.45***	[0.35,0.58]
Higher grade or equivalent	0.49***	[0.33,0.72]
Standard grade	0.43***	[0.28,0.66]
Other	0.80	[0.45,1.43]
No qualifications	0.32***	[0.17,0.58]

Controlling for all other covariates (not shown)

a. All N values are based on un-weighted data. Significance levels: * p <0.05, ** p <0.01, *** p<0.001. 95% confidence intervals in brackets